CLAIMS

We claim:

1. An apparatus; comprising:

a wavelength tracking component to determine a difference between transmission band of wavelengths of a first multiplexer/demultiplexer and a second multiplexer/demultiplexer in order to provide a control signal to match the transmission band of wavelengths of the first multiplexer/demultiplexer and the second multiplexer/demultiplexer, wherein the first multiplexer/demultiplexer is located in a first location and the second multiplexer/demultiplexer is located in a second location remote from the first location; and

a transmission wavelength controller to alter an operational parameter of the first multiplexer/demultiplexer based on the control signal to control the transmission band of wavelengths of the first multiplexer/demultiplexer.

2. The apparatus of claim 1, wherein the wavelength tracking component further comprises:

a lock-in detector coupled to the first multiplexer/demultiplexer and an oscillator.

3. The apparatus of claim 1, wherein the transmission wavelength controller comprises a temperature controller to alter an operating temperature of the first multiplexer/demultiplexer based on the control signal.

4. The apparatus of claim 2, wherein the wavelength tracking component further comprises:

a power summing device to measure a strength of an output signal from one or more optical receivers, wherein the power summing device electrically couples to the temperature controller; and

the temperature controller alters the operating temperature of the first multiplexer/demultiplexer to achieve substantially a maximum power output from the power summing device.

5. The apparatus of claim 4, wherein the power summing device is an electrical power summing device.

6. The apparatus of claim 3, wherein the temperature controller dithers the operating temperature of the first multiplexer/demultiplexer in a first direction and then measures whether a strength of the control signal changes, and adjusts the operating temperature of the first multiplexer/demultiplexer based upon the detected change.

7. A passive optical network, comprising:

a first multiplexer/demultiplexer located in a first location;

a second multiplexer/demultiplexer located in a second location remote from the first location;

a wavelength tracking component that determines a difference between the transmission band of wavelengths of the first multiplexer/demultiplexer and the second multiplexer/demultiplexer to provide a control signal, wherein the wavelength tracking component couples to a port of the first multiplexer/demultiplexer; and

a transmission wavelength controller to alter an operational parameter of the first multiplexer/demultiplexer based on the control signal to control the transmission band of wavelengths of the first multiplexer/demultiplexer.

8. The passive optical network of claim 7, further comprising:

a first broadband light source to supply an optical signal containing a first band of wavelengths to the second multiplexer/demultiplexer;

a second broadband light source to supply an optical signal containing a second band of wavelengths to the first multiplexer/demultiplexer, and

an oscillator to modulate the second broadband light source at a known frequency to generate a modulated second band of wavelengths.

9. The passive optical network of claim 8, further comprising:

a mirror coupled to the second multiplexer/demultiplexer to reflect a portion of the modulated second band of wavelengths to the wavelength tracking component.

10. The passive optical network of claim 9, wherein the wavelength tracking component measures a difference in the transmission band of wavelengths between the first multiplexer/demultiplexer and the second multiplexer/demultiplexer based upon a change detected in the reflected portion of the modulated second band of wavelengths.

11. The passive optical network of claim 9, wherein the wavelength tracking component further comprises:

a lock-in detector to establish an amplitude of the reflected modulated signal by comparing the reflected modulated signal to a reference signal.

12. The passive optical network of claim 8, wherein the wavelength tracking component compares the known frequency and phase of a signal from the oscillator to the frequency and phase of a reflected signal to determine a temperature difference between the first multiplexer/demultiplexer and the second multiplexer/demultiplexer.

13. The passive optical network of claim 8, wherein the wavelength tracking component measures a difference in transmission band of wavelengths between the first multiplexer/demultiplexer and the second multiplexer/demultiplexer based upon a change detected in a transmitted signal from one or more subscribers, wherein the transmitted signal is derived from the modulated second band of wavelengths.

14. The passive optical network of claim 7, further comprising:

a first group of optical transmitters to emit optical signals in a first band of wavelengths;

a first group of optical receivers to accept optical signals in a second band of wavelengths, wherein the first group of optical transmitters and the first group of optical receivers couple to the first multiplexer/demultiplexer by a first group of band splitting filters;

a second group of optical transmitters to emit optical signals in the second band of wavelengths; and

a second group of optical receivers to accept optical signals in the first band of wavelengths, wherein the second group of optical transmitters and the second group of optical receivers couple to the second multiplexer/demultiplexer by a second group of band splitting filters.

15. The passive optical network of claim 14, further comprising:

a first optical transmitter in the second group of optical transmitters, wherein the second multiplexer/demultiplexer spectrally slices the second band of wavelengths to

lock an output wavelength of the first optical transmitter to within the bandwidth of the spectral slice.

16. The passive optical network of claim 7, wherein the transmission wavelength controller comprises a temperature controller to alter an operating temperature of the first multiplexer/demultiplexer based on the control signal.

17. The passive optical network of claim 16, wherein the first multiplexer/demultiplexer has a greater transmission wavelength change ratio per degree change in temperature than the second optical multiplexer/demultiplexer.

18. The passive optical network of claim 7, further comprising:

a fiber fault detector to detect a defect in optical paths delivering optical signals to and from in the passive optical network.

19. A passive optical network, comprising:

a first broadband light source to generate an optical signal having a first band of wavelengths;

an optical multiplexer/demultiplexer to multiplex the optical signal having the first band of wavelengths to a plurality of subscribers; and

a fiber fault detector to detect a fault in an optical path to the subscribers, wherein the fiber fault detector compares the optical signal having the first band of wavelengths going to the subscribers to a reflection of that signal.

20. The passive optical network of claim 19, further comprising:

an optical coupler operating in both the first band of wavelengths and a second band of wavelengths, the optical coupler to route at least a portion of the optical signal having the first band of wavelengths and at least a portion of the reflection of that signal to the fiber fault detector.

21. The passive optical network of claim 19, further comprising:

an optical band splitting filter coupled to the fiber fault detector as well as an optical terminator.

22. The passive optical network of claim 19, wherein the fiber fault detector includes a photo-detector, a low pass filter, a divider, and a comparator.

23. The passive optical network of claim 19, wherein the fiber fault detector compares a ratio of the reflected signal to the optical signal with a reference value to determine if the fault exists in the optical path going to the subscribers.

24. The passive optical network of claim 19, wherein the fiber fault detector compares total power of a transmitted signal from the subscribers to a reference value to determine if the fault exists in the optical path to and from the subscribers.

25. The passive optical network of claim 19, further comprising

a plurality of receivers to receive a signal from the subscribers; wherein each receiver may compare the strength the received signal to a reference value and communicate with the fiber fault detector if that received signal falls below the reference value.

26. The passive optical network of claim 19, further comprising:

a second optical multiplexer/demultiplexer to multiplex and demultiplex bi-directionally.

27. The passive optical network of claim 26, further comprising:

a wavelength tracking component having a power combiner to measure total power of a transmitted signal from the subscribers after passing through the second optical multiplexer/demultiplexer; and

a temperature controller to control an operating temperature of the second optical multiplexer/demultiplexer to maximize the output power of the power combiner.

28. The passive optical network of claim 19, wherein the optical multiplexer/demultiplexer is an athermal arrayed waveguide grating.

29. The passive optical network of claim 19, wherein the optical multiplexer/demultiplexer is an arrayed waveguide grating.

30. A method, comprising:

supplying an optical signal containing a first band of wavelengths to a first multiplexer/demultiplexer in a passive optical network;

supplying an optical signal containing a second band of wavelengths to a second multiplexer/demultiplexer in the passive optical network;

measuring an optical power of the second band of wavelengths after passing through the first multiplexer/demultiplexer; and

adjusting a transmission band of wavelengths passed by the first multiplexer/demultiplexer based upon achieving substantially maximum power for the measured optical power of the second band of wavelengths.

31. An apparatus, comprising:

means for supplying an optical signal containing a first band of wavelengths to a first multiplexer/demultiplexer in a passive optical network;

means for supplying an optical signal containing a second band of wavelengths to a second multiplexer/demultiplexer in the passive optical network;

means for measuring an optical power of the second band of wavelengths after passing through the first multiplexer/demultiplexer; and

means for adjusting a transmission band of wavelengths passed by the first multiplexer/demultiplexer based upon achieving substantially maximum power for the measured optical power of the second band of wavelengths.

32. A method, comprising

extracting at least a portion of an optical signal having a first band of wavelengths going to subscribers in a passive optical network;

filtering out wavelengths not in the first band of wavelengths;

routing at least a portion of a reflection of the optical signal having the first band of wavelengths; and

comparing the portion of the optical signal having the first band of wavelengths to the portion of the reflection of that signal to determine if a fault exists in an optical path going to the subscribers.

33. An apparatus, comprising:

means for extracting at least a portion of an optical signal having a first band of wavelengths going to subscribers in a passive optical network;

means for filtering out wavelengths not in the first band of wavelengths;

means for routing at least a portion of a reflection of the optical signal having the first band of wavelengths; and

means for comparing the portion of the optical signal having the first band of wavelengths to the portion of the reflection of that signal to determine if a fault exists in an optical path going to the subscribers.